

Emission Information Summary - PTI Application No. A0056213

Net Change in PM Emissions

Pollutant	Permit Allowable	Current Calculated PM		Requested	New Calculated PM		Net Change		Net Change		
	PM Limit ^(a)	Emissions	(lb/hr)	Allowable PM	Emissions	(lb/hr)	(ton/year)	(allowable)	(Actual)	(lb/hr)	(ton/year)
North End Copper Calciners (NOx-generating Family of Products)											
P006 - Copper Calciner #1	2.13	No change in PM emissions due to the proposed NOx-generating Family of Products									
P095 - Copper Calciner #2	2.13	No change in PM emissions due to the proposed NOx-generating Family of Products									
South End General Catalyst Lines 1 - 4 Throuput Increase^(b)											
P010 - Rotary Calciner #1	1.62	0.68	3.0	3.07	1.73	7.6	1.45	6.4	1.05	4.6	
P102 - Rotary Calciner #2	1.62	0.68	3.0	3.07	1.72	7.5	1.45	6.4	1.04	4.6	
P103 - Rotary Calciner #3	1.62	0.68	3.0	3.07	1.72	7.5	1.45	6.4	1.04	4.6	
P009 - Rotary Calciner #4	2.28	1.11	4.9	3.07	1.72	7.5	0.79	3.5	0.61	2.7	
Tableting Precursor Line Capture Efficiency Reduction (100% to 95%)											
P131 - Tableting Precursor	1.51	0.143	0.63	1.51	0.27	1.2	0	0	0.12	0.55	
Pfaudler Double-cone Blender B-1 NOx Control Efficiency Reduction (95% to 90%)											
P026 - Double-cone Blender #1	2.31	No change in PM emissions due to the proposed NOx-generating Family of Products									

a. Particulate emissions from all process operations combined, excluding PE from natural gas combustion. PE limit from natural gas combustion is 0.020 lb/MMBtu.

b. Calculated PM emissions from South End General Catalyst based on site-specific PM emission factor, not the AP-42 factor used for the current PM emissions.

Net Change in NOx Emissions

Pollutant	Permit Allowable	Current Calculated NOx		Requested	New Calculated NOx		Net Change		Net Change		
	NOx Limit	Emissions ^(a)	(lb/hr)	Allowable	NOx Limit ^(b)	Emissions ^(a)	(lb/hr)	(ton/year)	(allowable)	(Actual)	
North End Copper Calciners (NOx-generating Family of Products)											
P006 - Copper Calciner #1	0	0	0	0.89	0.89	3.9	0.89	3.9	0.89	3.9	
P095 - Copper Calciner #2	0	0	0	0.89	0.89	3.9	0.89	3.9	0.89	3.9	
South End General Catalyst Lines 1 - 4 Throuput Increase^(b)											
P010 - Rotary Calciner #1	3.4	No change in NOx emissions due to the proposed process weight rate increase									
P102 - Rotary Calciner #2	3.4	No change in NOx emissions due to the proposed process weight rate increase									
P103 - Rotary Calciner #3	3.4	No change in NOx emissions due to the proposed process weight rate increase									
P009 - Rotary Calciner #4	3.4	No change in NOx emissions due to the proposed process weight rate increase									
Tableting Precursor Line Capture Efficiency Reduction (100% to 95%)											
P131 - Tableting Precursor		No change in NOx emissions due to the proposed reduction in PM capture efficiency									
Pfaudler Double-cone Blender B-1 NOx Control Efficiency Reduction (95% to 90%)											
P026 - Double-cone Blender #1	0.95	0.95	4.16	1.90	1.90	8.32	0.95	4.2	0.95	4.2	

a. Calculated NOx emissions include process emissions only, not combustion emissions for the indirect-fired calciners.

b. Requested allowable NOx limit only includes process emissions, not combustion emissions for the indirect-fired calciners.

BASF - Elyria, OH
Potential to Emit Calculations
P006 - Copper Calciner #1 (Building 26)

Basis:

a. Potential emissions are based on an operation schedule of:

24	hr/day
365	day/yr
8760	hr/yr

b. Permitted allowable emissions are:

process	2.13	lb PM/hr	Limit from PTI Mod. based on 750 lb/hr
combustion	0.02	lb PM/MMBtu	Limit from PTI Mod.
	20.4	lb PM/ 10^6 scf	(less stringent than AP-42)

PROCESS EMISSIONS OF PARTICULATE MATTER

a. The process includes four steps: calcining, raw material feed, product discharge, and product drumming.

Calciner process emissions exhaust to baghouse DC-26-02.

Raw material feed from tote bin through feed receiver to feed hopper with feed screw to calciner - feed receiver max flow rate is: 2,000 ft^3/min

Product discharge from calciner to product receiver to tote bin loading or drumming station - product receiver max flow rate is: 2,000 ft^3/min

Material transfer point to tote bins or drums with dust control by baghouse DC-26-03

b. Maximum hourly throughput, process steps, and process emission factors are:

Emission Factor Activity	AP-42 Section	Emission Factors		Throughput Rate		Number of Transfer Points
		PM (lb/ton)	PM10 (lb/ton)	lb/hr	ton/hr	
Rotary calcining	Fire Clay Processing, Table 11.25-7	120	30	750	0.375	
Material handling and transfer	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	750	0.375	1

Emissions from the raw material feed and product discharge are based on an exhaust grain loading of:

0.03 gr/ft^3

It is assumed that a portion of the PM emissions are HAP and based on the following product:

Product Code	Highest Individual HAP	
	Percentage	HAP
55226358	80%	chromium

c. Process emissions are controlled by the following:

Device	Capture Efficiency (%)	Control Efficiency (%)	Overall Control Efficiency (%)	Use Control in Calculated PTE?
Main Draft baghouse (calciner)	100%	99%	99%	Yes
Baghouse 58007100 (product drumming)	95%	99%	94%	Yes

PROCESS EMISSIONS OF NITROGEN OXIDES

- a. Measured NOx emission data based on actual concentration measured at calciner breach.
- b. The average nitrate (NO₃) content of precursor feed measured by BASF Elyria QC department.
- c. NO₃ to NOx conversion factor of 6% was calculated from measured NOx and NO₃ data for the family of product.
- d. Process variables that affect NOx generation are: 1) percent NO₃ and percent LOI of the feed material and 2) calciner production rate.
 - 1. Percent NO₃ and LOI are controlled in an upstream process to a maximum of 2.0% NO₃ and 25% LOI.
 - 2. Maximum discharge rate based on defined product formulation.
For the family of product, the steady-state production rate ranges from 400 to 650 lb/hr.

NOx generation rate calculated as follows:

$$NO_x \left(\frac{lb}{hr} \right) = \frac{PR \cdot \%NO_3 \cdot \%Conv \cdot MW_{NO_x}}{(1 - \%LOI_{@cal,temp}) \cdot MW_{NO_3}}$$

where,

NOx = mass rate of NOx (NO₂) generated during calcination process (lb/hr)
 PR = maximum production rate (650 lb/hr)
 %NO₃ = percent NO₃ in feed material (2.0%)
 %Conv = percent conversion of NO₂ to NOx (6%)
 MW_{NOx} = molecular weight of NOx (conservatively assumed to be all NO₂, 46 lb/lb-mol)
 %LOI = percent LOI in feed material (25%)
 MW_{NO₃} = molecular weight of nitrate (62 lb/lb-mol)

Parameter	Value
Maximum Production Rate	650
%NO ₃	2.0%
% Conversion	6.0%
%LOI	25%

Product	Product-specific Production Rate (lb/hr)	NOx Emissions (lb/hr)
Cu 1800 P	400	0.47
Cu 1820 P	400	0.47
Cu 1885 P	650	0.77
Cu 1950 P	650	0.77
Cu 1136 P	600	0.71
Cu 0396 P	650	0.77
permitted production rate	750	0.89

NATURAL GAS COMBUSTION EMISSIONS

a. The emission unit is heated with natural gas and has the following heat capacity:

The heat content of natural gas is:

1,020 Btu/scf

2.01 10^6 Btu/hr

0.002 10^6 scf/hr

b. Natural gas combustion emissions are based on the following emission factors from AP-42 Section 1.4:

Pollutant	Emission Factor (lb/ 10^6 scf)
particulate matter (PM)	7.6
PM10, filterable	1.9
nitrogen oxides (NO _x)	100
carbon monoxide (CO)	84
sulfur dioxide (SO ₂)	0.6
volatile organic compounds (VOC)	5.5
HAPs	
1,3-butadiene	
2-methylnaphthalene	2.40E-05
3-methylchloranthrene	1.80E-06
7,12-dimethylbenz(a)anthracene	1.60E-05
acenaphthene	1.80E-06
acenaphthylene	1.80E-06
acetaldehyde	
acrolein	
anthracene	2.40E-06
benz(a)anthracene	1.80E-06
benzene	2.10E-03
benzo(a)pyrene	1.20E-06
benzo(b)fluoranthene	1.80E-06
benzo(g,h,i)perylene	1.20E-06
benzo(k)fluoranthene	1.80E-06
chrysene	1.80E-06
dibenz(a,h)anthracene	1.20E-06
dichlorobenzene	1.20E-03
fluoranthene	3.00E-06
fluorene	2.80E-06
formaldehyde	7.50E-02
hexane	1.8
indeno(1,2,3-cd)pyrene	1.80E-06
naphthalene	6.10E-04
phenanthrene	1.70E-05
pyrene	5.00E-06
toluene	3.40E-03
xylene	
arsenic	2.00E-04
beryllium	1.20E-05
cadmium	1.10E-03
chromium	1.40E-03
cobalt	8.40E-05
manganese	3.80E-04
mercury	2.60E-04
nickel	2.10E-03
selenium	2.40E-05

Emissions Calculations:

Process Emissions:

Uncontrolled PM Emissions (lb/hr)	=	(throughput rate, ton/hr) x (emission factor, lb PM/ton)
Uncontrolled HAP Emissions (lb/hr)	=	(PM emissions, lb/hr) x (max individual HAP content, lb/lb)
Controlled emissions (lb/hr)	=	(uncontrolled emissions, lb/hr) x (1 - control efficiency)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Combustion Emissions:

Emissions (lb/hr)	=	(heat capacity, 10^6 Btu/hr) / (natural gas heat content, Btu/scf) x (emission factor, lb/ 10^6 scf)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Emissions Summary:

Pollutant	Process Emissions (lb/hr)			REVISED PTE (ton/yr)	EXISTING PTE (ton/yr)	CHANGE IN EMISSIONS (ton/yr)
	Uncontrolled	Controlled	Allowable			
PM, total	46.07	1.48	2.13	0.01	6.6	6.6
PM10, total	12.30	1.14		0.01	5.1	5.1
PM10, filterable	12.30	1.14		0.004	5.0	5.0
NOx	0.89	0.89		0.20	4.8	0.9
CO				0.17	0.7	0.7
SO2				0.001	0.01	0.01
VOC				0.01	0.05	0.05
1,3-butadiene				0.0E+00	0.0E+00	0.0E+00
2-methylnaphthalene				4.7E-08	2.1E-07	2.1E-07
3-methylchloranthrene				3.5E-09	1.6E-08	1.6E-08
7,12-dimethylbenz(a)anthracene				3.2E-08	1.4E-07	1.4E-07
acenaphthene				3.5E-09	1.6E-08	1.6E-08
acenaphthylene				3.5E-09	1.6E-08	1.6E-08
acetaldehyde				0.0E+00	0.0E+00	0.0E+00
acrolein				0.0E+00	0.0E+00	0.0E+00
anthracene				4.7E-09	2.1E-08	2.1E-08
benz(a)anthracene				3.5E-09	1.6E-08	1.6E-08
benzene				4.1E-06	1.8E-05	1.8E-05
benzo(a)pyrene				2.4E-09	1.0E-08	1.0E-08
benzo(b)fluoranthene				3.5E-09	1.6E-08	1.6E-08
benzo(g,h,i)perylene				2.4E-09	1.0E-08	1.0E-08
benzo(k)fluoranthene				3.5E-09	1.6E-08	1.6E-08
chrysene				3.5E-09	1.6E-08	1.6E-08
dibenz(a,h)anthracene				2.4E-09	1.0E-08	1.0E-08
dichlorobenzene				2.4E-06	1.0E-05	1.0E-05
fluoranthene				5.9E-09	2.6E-08	2.6E-08
fluorene				5.5E-09	2.4E-08	2.4E-08
formaldehyde				1.5E-04	6.5E-04	6.5E-04
hexane				3.5E-03	0.02	0.02
indeno(1,2,3-cd)pyrene				3.5E-09	1.6E-08	1.6E-08
naphthalene				1.2E-06	5.3E-06	5.3E-06
phenanthrene				3.4E-08	1.5E-07	1.5E-07
pyrene				9.9E-09	4.3E-08	4.3E-08
toluene				6.7E-06	2.9E-05	2.9E-05
xylene				0.0E+00	0.0E+00	0.0E+00
arsenic				3.9E-07	1.7E-06	1.7E-06
beryllium				2.4E-08	1.0E-07	1.0E-07
cadmium				2.2E-06	9.5E-06	9.5E-06
chromium	36.86	1.18		2.8E-06	5.2	5.2
cobalt				1.7E-07	7.3E-07	7.3E-07
manganese				7.5E-07	3.3E-06	3.3E-06
mercury				5.1E-07	2.2E-06	2.2E-06
nickel				4.1E-06	1.8E-05	1.8E-05
selenium				4.7E-08	2.1E-07	2.1E-07
Total HAPs	36.86	1.18		0.004	5.2	5.2

PTI APPLICATION EMISSIONS INFORMATION

Criteria Pollutants :

Pollutant	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
Particulate emissions (PE/PM) (formerly particulate matter, PM)	No change in PM emissions as a result of this modification				
PM # 10 microns in diameter (PE/PM10)	No change in PM10 emissions as a result of this modification				
PM # 2.5 microns in diameter (PE/PM2.5)	No change in PM2.5 emissions as a result of this modification				
Sulfur dioxide (SO2)	No change in SO2 emissions as a result of this modification				
Nitrogen oxides (NOx)	0.89	0.89	3.9	0.89	3.9
Carbon monoxide (CO)	No change in CO emissions as a result of this modification				
Organic compounds (OC)	No change in OC emissions as a result of this modification				
Volatile organic compounds (VOC)	No change in VOC emissions as a result of this modification				
Lead (Pb)	0	0	0	0	0.0
Total Hazardous Air Pollutants (HAPs)	No change in HAP emissions as a result of this modification				
Highest single HAP - chromium	No change in HAP emissions as a result of this modification				

Process Emissions Only

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
chromium	HAP	No change in HAP emissions as a result of this modification				

BASF - Elyria, OH
Potential to Emit Calculations
P095 - Copper Calciner #2 (Building 26)

Basis:

a. Potential emissions are based on an operation schedule of:	24 365 8760	hr/day day/yr hr/yr
b. Permitted allowable emissions are:	(process) (fuel combustion)	2.13 0.02 20.4
		lb PM/hr lb PM/ 10^6 Btu lb PM/ 10^6 scf

Limit from PTI Mod.
 Limit from PTI Mod.
 (less stringent than AP-42)

PROCESS EMISSIONS OF PARTICULATE MATTER

- a. Maximum hourly throughput, process steps, and process emission factors are:

Emission Factor Activity	AP-42 Section	Emission Factors		ThroughputRate		Number of Transfer Points
		PM (lb/ton)	PM10 (lb/ton)	lb/hr	ton/hr	
Rotary Calcining (Calciner process emissions to main draft dust collector baghouse)	Fire Clay Processing, Table 11.25-7	120	30	750	0.375	
Material handling and transfer (Raw material loading to feed hopper with PM control by feed hopper dust collector baghouse)	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	750	0.375	1
Material handling and transfer (Product discharge to drumming station with PM control by dust collector baghouse 58007200)	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	750	0.375	1

- b. Process emissions are controlled by the following:

Device	Capture Efficiency (%)	Control Efficiency (%)	Overall Control Efficiency (%)	Use Control in Calculated PTE?
Main Draft DC (P095-B)	100%	99%	99%	Yes
Feed hopper DC baghouse (P095-A)	100%	99%	99%	Yes
Discharge Baghouse 58007200 (P095-C)	100%	99%	99%	Yes

PROCESS EMISSIONS OF NITROGEN OXIDES

- a. Measured NOx emission data based on actual concentration measured at calciner breach.
 - b. The average nitrate (NO₃) content of precursor feed measured by BASF Elyria QC department.
 - c. NO₃ to NOx conversion factor of 6% was calculated from measured NOx and NO₃ data for the family of product.
 - d. Process variables that affect NOx generation are: 1) percent NO₃ and percent LOI of the feed material and 2) calciner production rate.
1. Percent NO₃ and LOI are controlled in an upstream process to a maximum of 2.0% NO₃ and 25% LOI.
 2. Maximum discharge rate based on defined product formulation.
For the family of product, the steady-state production rate ranges from 400 to 650 lb/hr.

NOx generation rate calculated as follows:

$$NO_x (\text{lb/hr}) = \frac{PR \cdot \%NO_3 \cdot \%Conv \cdot MW_{NO_x}}{(1 - \%LOI_{@cal.temp}) \cdot MW_{NO_3}}$$

where,

NOx = mass rate of NOx (NO₂) generated during calcination process (lb/hr)
 PR = maximum production rate (650 lb/hr)
 %NO₃ = percent NO₃ in feed material (2.0%)
 %Conv = percent conversion of NO₃ to NOx (6%)
 MW_{NOx} = molecular weight of NOx (conservatively assumed to be all NO₂, 46 lb/lb-mol)
 %LOI = percent LOI in feed material (2.5%)
 MW_{NO₃} = molecular weight of nitrate (62 lb/lb-mol)

Parameter	Value
Maximum Production Rate	650
%NO ₃	2.0%
% Conversion	6.0%
%LOI	25%

Product	Product-specific Production Rate (lb/hr)	NOx Emissions (lb/hr)
Cu 1800 P	400	0.47
Cu 1820 P	400	0.47
Cu 1885 P	650	0.77
Cu 1950 P	650	0.77
Cu 1136 P	600	0.71
Cu 0396 P	650	0.77
permitted production rate	750	0.89

NATURAL GAS COMBUSTION EMISSIONS

a. The emission unit is heated with natural gas and has the following heat capacity:
 The heat content of natural gas is:

1,020	Btu/scf	2.25	10 ⁶ Btu/hr
		0.002	10 ⁶ scf/hr

b. Natural gas combustion emissions are based on the following emission factors from AP-42 Section 1.4:

Pollutant	Emission Factor (lb/10 ⁶ scf)
particulate matter (PM)	7.6
PM10, filterable	1.9
nitrogen oxides (NO _x)	100
carbon monoxide (CO)	84
sulfur dioxide (SO ₂)	0.6
volatile organic compounds (VOC)	5.5
HAPs	
1,3-butadiene	
2-methylnaphthalene	2.40E-05
3-methylchloranthrene	1.80E-06
7,12-dimethylbenz(a)anthracene	1.60E-05
acenaphthene	1.80E-06
acenaphthylene	1.80E-06
acetaldehyde	
acrolein	
anthracene	2.40E-06
benz(a)anthracene	1.80E-06
benzene	2.10E-03
benzo(a)pyrene	1.20E-06
benzo(b)fluoranthene	1.80E-06
benzo(g,h,i)perylene	1.20E-06
benzo(k)fluoranthene	1.80E-06
chrysene	1.80E-06
dibenzo(a,h)anthracene	1.20E-06
dichlorobenzene	1.20E-03
fluoranthene	3.00E-06
fluorene	2.80E-06
formaldehyde	7.50E-02
hexane	1.8
indeno(1,2,3-cd)pyrene	1.80E-06
naphthalene	6.10E-04
phenanthrene	1.70E-05
pyrene	5.00E-06
toluene	3.40E-03
xylene	
arsenic	2.00E-04
beryllium	1.20E-05
cadmium	1.10E-03
chromium	1.40E-03
cobalt	8.40E-05
manganese	3.80E-04
mercury	2.60E-04
nickel	2.10E-03
selenium	2.40E-05

Emissions Calculations:

Process Emissions:

Uncontrolled PM Emissions (lb/hr) = (throughput rate, ton/hr) x (emission factor, lb PM/ton)

Controlled emissions (lb/hr) = (uncontrolled emissions, lb/hr) x (1 - control efficiency)

Emissions (ton/yr) = (emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Combustion Emissions:

Emissions (lb/hr) = (heat capacity, 10^6 Btu/hr) / (natural gas heat content, Btu/scf) x (emission factor, lb/ 10^6 scf)

Emissions (ton/yr) = (emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Emissions Summary:

Pollutant	Process Emissions (lb/hr)			Combustion Emissions (lb/hr)	REVISED PTE (ton/yr)	EXISTING PTE (ton/yr)	CHANGE IN EMISSIONS (ton/yr)
	Uncontrolled	Controlled	Allowable	Uncontrolled			
PM, total	45.09	0.45	2.13	0.02	2.0	2.0	0
PM10, total	11.30	0.11		0.02	0.6	0.6	0
PM10, filterable	11.30	0.11		0.004	0.5	0.5	0
NOx	0.89	0.89		0.22	4.9	1.0	3.9
CO				0.19	0.8	0.8	0
SO2				0.001	0.01	0.01	0
VOC				0.01	0.1	0.05	0
1,3-butadiene				0.0E+00	0.0E+00	0	0
2-methylnaphthalene				5.3E-08	2.3E-07	2.3E-07	0
3-methylchloranthrene				4.0E-09	1.7E-08	1.7E-08	0
7,12-dimethylbenz(a)anthracene				3.5E-08	1.5E-07	1.5E-07	0
acenaphthene				4.0E-09	1.7E-08	1.7E-08	0
acenaphthylene				4.0E-09	1.7E-08	1.7E-08	0
acetaldehyde				0.0E+00	0.0E+00	0.0E+00	0
acrolein				0.0E+00	0.0E+00	0.0E+00	0
anthracene				5.3E-09	2.3E-08	2.3E-08	0
benz(a)anthracene				4.0E-09	1.7E-08	1.7E-08	0
benzene				4.6E-06	2.0E-05	2.0E-05	0
benzo(a)pyrene				2.6E-09	1.2E-08	1.2E-08	0
benzo(b)fluoranthene				4.0E-09	1.7E-08	1.7E-08	0
benzo(g,h,i)perylene				2.6E-09	1.2E-08	1.2E-08	0
benzo(k)fluoranthene				4.0E-09	1.7E-08	1.7E-08	0
chrysene				4.0E-09	1.7E-08	1.7E-08	0
dibenzo(a,h)anthracene				2.6E-09	1.2E-08	1.2E-08	0
dichlorobenzene				2.6E-06	1.2E-05	1.2E-05	0
fluoranthene				6.6E-09	2.9E-08	2.9E-08	0
fluorene				6.2E-09	2.7E-08	2.7E-08	0
formaldehyde				1.7E-04	7.2E-04	7.2E-04	0
hexane				4.0E-03	0.02	0.02	0
indeno(1,2,3-cd)pyrene				4.0E-09	1.7E-08	1.7E-08	0
naphthalene				1.3E-06	5.9E-06	5.9E-06	0
phenanthrene				3.8E-08	1.6E-07	1.6E-07	0
pyrene				1.1E-08	4.8E-08	4.8E-08	0
toluene				7.5E-06	3.3E-05	3.3E-05	0
xylene				0.0E+00	0.0E+00	0.0E+00	0
arsenic				4.4E-07	1.9E-06	1.9E-06	0
beryllium				2.6E-08	1.2E-07	1.2E-07	0
cadmium				2.4E-06	1.1E-05	1.1E-05	0
chromium				3.1E-06	1.4E-05	1.4E-05	0
cobalt				1.9E-07	8.1E-07	8.1E-07	0
manganese				8.4E-07	3.7E-06	3.7E-06	0
mercury				5.7E-07	2.5E-06	2.5E-06	0
nickel				4.6E-06	2.0E-05	2.0E-05	0
selenium				5.3E-08	2.3E-07	2.3E-07	0
Total HAPs	0.00	0.00		0.00	0.02	0.02	0

PTI APPLICATION EMISSIONS INFORMATION

Criteria Pollutants :

Pollutant	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
Particulate emissions (PE/PM) (formerly particulate matter, PM)	No change in PM emissions as a result of this modification				
PM # 10 microns in diameter (PE/PM10)	No change in PM10 emissions as a result of this modification				
PM # 2.5 microns in diameter (PE/PM2.5)	No change in PM2.5 emissions as a result of this modification				
Sulfur dioxide (SO2)	No change in SO2 emissions as a result of this modification				
Nitrogen oxides (NOx)	0.89	0.89	3.9	0.89	3.9
Carbon monoxide (CO)	No change in CO emissions as a result of this modification				
Organic compounds (OC)	No change in OC emissions as a result of this modification				
Volatile organic compounds (VOC)	No change in VOC emissions as a result of this modification				
Lead (Pb)	0	0	0	0	0.0
Total Hazardous Air Pollutants (HAPs)	No change in HAP emissions as a result of this modification				
Highest single HAP	No change in HAP emissions as a result of this modification				

Process emissions only

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
N/A		No change in HAP emissions as a result of this modification				

BASF - Elyria, OH
Potential to Emit Calculations
P009 - Rotary Calciner #4 (Building 16)

Basis:

a. Potential emissions are based on an operation schedule of:	24	hr/day		
	365	day/yr		
	8760	hr/yr		
b. Permitted allowable emissions are:				
	process	2.28	lb PM/hr	Limit from 9/20/1993 PTO based on 833 lb/hr
		1.86	lb NOx/hr	NOx RACT limit when operating the SCR
		3.4	lb NOx/hr	NOx RACT limit when operating the Trimer
	combustion	0.02	lb PM/ 10^6 Btu	Limit from 9/20/1993 PTO
		20.4	lb PM/ 10^6 scf	(inherently compliant using AP-42)

PROCESS EMISSIONS OF PARTICULATE MATTER

- a. Maximum hourly throughput, process steps, and process emission factors are:

Emission Factor Activity	Site Specific Factor or AP-42 Section	Emission Factors		Throughput Rate		Number of Transfer Points
		PM (lb/ton)	PM10 (lb/ton)*	lb/hr	ton/hr	
Rotary calcining	Site specific emission factor	52	13	1,300	0.65	
Material handling and transfer (feed) (Raw material feed from to feed hopper and to calciner)	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1,300	0.65	2
Material handling and transfer (discharge) (Product discharged from calciner to product hopper and packaging)	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1,300	0.65	2

* The PM10 fraction is assumed to be the same fraction as for the Fire Clay Processing emission factors in AP-42 Table 11.25-7 (30 lb PM10/ton/120 lb PM/ton = 0.25).

It is assumed that a portion of the PM emissions are HAP and based on the following product:

Product Code	Highest Individual HAP	
	Percentage	HAP
50102068	25%	chromium

- b. Process emissions are controlled by the following:

Device	Capture Efficiency (%)	Control Efficiency (%)	Overall Control Efficiency (%)	Use Control in Calculated PTE?
TriMer Scrubber (calcining) (least efficient of TriMer scrubber or SCR baghouse)	100%	95%	95%	No
Baghouse 4A (feed) (P009-1)	99%	99%	98%	Yes
Baghouse 4B (discharge) (P009-3)	99%	99%	98%	Yes

NATURAL GAS COMBUSTION EMISSIONS

a. The emission unit is heated with natural gas and has the following heat capacity:
The heat content of natural gas is:

1,020 Btu/scf

3.35 10^6 Btu/hr
0.003 10^6 scf/hr

b. Natural gas combustion emissions are based on the following emission factors from AP-42 Section 1.4:

Pollutant	Emission Factor (lb/ 10^6 scf)
particulate matter (PM)	7.6
PM10, filterable	1.9
nitrogen oxides (NO _x)	100
carbon monoxide (CO)	84
sulfur dioxide (SO ₂)	0.6
volatile organic compounds (VOC)	5.5
HAPs	
1,3-butadiene	
2-methylnaphthalene	2.40E-05
3-methylchloranthrene	1.80E-06
7,12-dimethylbenz(a)anthracene	1.60E-05
acenaphthene	1.80E-06
acenaphthylene	1.80E-06
acetaldehyde	
acrolein	
anthracene	2.40E-06
benz(a)anthracene	1.80E-06
benzene	2.10E-03
benzo(a)pyrene	1.20E-06
benzo(b)fluoranthene	1.80E-06
benzo(g,h,i)perylene	1.20E-06
benzo(k)fluoranthene	1.80E-06
chrysene	1.80E-06
dibenzo(a,h)anthracene	1.20E-06
dichlorobenzene	1.20E-03
fluoranthene	3.00E-06
fluorene	2.80E-06
formaldehyde	7.50E-02
hexane	1.8
indeno(1,2,3-cd)pyrene	1.80E-06
naphthalene	6.10E-04
phenanthrene	1.70E-05
pyrene	5.00E-06
toluene	3.40E-03
xylene	
arsenic	2.00E-04
beryllium	1.20E-05
cadmium	1.10E-03
chromium	1.40E-03
cobalt	8.40E-05
manganese	3.80E-04
mercury	2.60E-04
nickel	2.10E-03
selenium	2.40E-05

Emissions Calculations:

Process Emissions:

Uncontrolled PM Emissions (lb/hr)	=	(throughput rate, ton/hr) x (emission factor, lb PM/ton)
Uncontrolled HAP Emissions (lb/hr)	=	(PM emissions, lb/hr) x (max individual HAP content, lb/lb)
Controlled emissions (lb/hr)	=	(uncontrolled emissions, lb/hr) x (1 - control efficiency)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Combustion Emissions:

Emissions (lb/hr)	=	(heat capacity, 10^6 Btu/hr) / (natural gas heat content, Btu/scf) x (emission factor, lb/ 10^6 scf)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Emissions Summary:

Pollutant	Process Emissions (lb/hr)			Combustion Emissions (lb/hr)	REVISED PTE (ton/yr)	EXISTING PTE (ton/yr) (from Title V)	CHANGE IN EMISSIONS (ton/yr)
	Uncontrolled	Controlled	Allowable				
PM, total	34.11	1.70	3.07	0.02	13.5	10.0	3.5
PM10, total	8.61	0.43		0.02	13.5	10.0	3.5
PM10, filterable	8.61	0.43		0.01	13.5	10.0	3.5
NOx			3.4	0.33	16.3	16.3	0.0
CO				0.28	1.2	1.2	0.0
SO2				0.002	0.01	0.01	0.0
VOC				0.02	0.1	0.1	0.0
1,3-butadiene				0.0E+00	0.0E+00	0.0E+00	0.0
2-methylnaphthalene				7.9E-08	3.5E-07	3.5E-07	0.0
3-methylchloranthrene				5.9E-09	2.6E-08	2.6E-08	0.0
7,12-dimethylbenz(a)anthracene				5.3E-08	2.3E-07	2.3E-07	0.0
acenaphthene				5.9E-09	2.6E-08	2.6E-08	0.0
acenaphthylene				5.9E-09	2.6E-08	2.6E-08	0.0
acetaldehyde				0.0E+00	0.0E+00	0.0E+00	0.0
acrolein				0.0E+00	0.0E+00	0.0E+00	0.0
anthracene				7.9E-09	3.5E-08	3.5E-08	0.0
benz(a)anthracene				5.9E-09	2.6E-08	2.6E-08	0.0
benzene				6.9E-06	3.0E-05	3.0E-05	0.0
benzo(a)pyrene				3.9E-09	1.7E-08	1.7E-08	0.0
benzo(b)fluoranthene				5.9E-09	2.6E-08	2.6E-08	0.0
benzo(g,h,i)perylene				3.9E-09	1.7E-08	1.7E-08	0.0
benzo(k)fluoranthene				5.9E-09	2.6E-08	2.6E-08	0.0
chrysene				5.9E-09	2.6E-08	2.6E-08	0.0
dibenzo(a,h)anthracene				3.9E-09	1.7E-08	1.7E-08	0.0
dichlorobenzene				3.9E-06	1.7E-05	1.7E-05	0.0
fluoranthene				9.9E-09	4.3E-08	4.3E-08	0.0
fluorene				9.2E-09	4.0E-08	4.0E-08	0.0
formaldehyde				2.5E-04	1.1E-03	1.1E-03	0.0
hexane				5.9E-03	0.03	0.03	0.0
indeno(1,2,3-cd)pyrene				5.9E-09	2.6E-08	2.6E-08	0.0
naphthalene				2.0E-06	8.8E-06	8.8E-06	0.0
phenanathrene				5.6E-08	2.4E-07	2.4E-07	0.0
pyrene				1.6E-08	7.2E-08	7.2E-08	0.0
toluene				1.1E-05	4.9E-05	4.9E-05	0.0
xylene				0.0E+00	0.0E+00	0.0E+00	0.0
arsenic				6.6E-07	2.9E-06	2.9E-06	0.0
beryllium				3.9E-08	1.7E-07	1.7E-07	0.0
cadmium				3.6E-06	1.6E-05	1.6E-05	0.0
chromium	8.53	0.42		4.6E-06	1.9	2.5	-0.6
cobalt				2.8E-07	1.2E-06	1.2E-06	0.0
manganese				1.2E-06	5.5E-06	5.5E-06	0.0
mercury				8.5E-07	3.7E-06	3.7E-06	0.0
nickel				6.9E-06	3.0E-05	3.0E-05	0.0
selenium				7.9E-08	3.5E-07	3.5E-07	0.0
Total HAPs	8.53	0.42		0.01	1.9	2.5	-0.6

PTI APPLICATION EMISSIONS INFORMATION

Criteria Pollutants :

Pollutant	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
Particulate emissions (PE/PM) (formerly particulate matter, PM)	34.11	1.70	7.4	3.07	13.5
PM # 10 microns in diameter (PE/PM10)	8.61	0.43	1.9	3.07	13.5
PM # 2.5 microns in diameter (PE/PM2.5)	8.61	0.43	1.9	3.07	13.5
Sulfur dioxide (SO2)	No change in SO2 emissions as a result of this modification				
Nitrogen oxides (NOx)	No change in NOx emissions as a result of this modification				
Carbon monoxide (CO)	No change in CO emissions as a result of this modification				
Organic compounds (OC)	No change in OC emissions as a result of this modification				
Volatile organic compounds (VOC)	No change in VOC emissions as a result of this modification				
Lead (Pb)	0	0	0	0	0.0
Total Hazardous Air Pollutants (HAPs)	8.53	0.43	1.9	0.43	1.9
Highest single HAP - chromium	8.53	0.42	1.9	0.42	1.9

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
chromium	HAP	8.53	0.42	1.9	0.42	1.9

BASF - Elyria, OH
Potential to Emit Calculations
P010 - Rotary Calciner #1 (Building 31)

Basis:

a. Potential emissions are based on an operation schedule of:		24	hr/day		
		365	day/yr		
		8760	hr/yr		
b. Permitted allowable emissions are:	(process)	1.62	lb PM/hr	Limit from 2001 Title V based on 500 lb/hr	
		1.86	lb NOx/hr	NOx RACT limit when operating the SCR	
		3.4	lb NOx/hr	NOx RACT limit when operating the Trimer	
	(fuel combustion)	0.02	lb PM/ 10^6 Btu	Limit from 2001 Title V	
		20.4	lb PM/ 10^6 scf	(inherently compliant using AP-42)	
				Previously on Registration Status	

PROCESS EMISSIONS OF PARTICULATE MATTER

- a. Maximum hourly throughput, process steps, and process emission factors are:

Emission Factor Activity	Site Specific Factor or AP-42 Section	Emission Factors		Throughput Rate		Number of Transfer Points
		PM (lb/ton)	PM10 (lb/ton)*	lb/hr	ton/hr	
Rotary calcining	Site specific emission factor	52	13	1,300	0.65	
Material handling and transfer (feed) (Raw material from dryer to elevator to feed hopper)	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1,300	0.65	2
Material handling and transfer (discharge) (Product discharge to elevator to screener to super sack)	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1,300	0.65	3

* The PM10 fraction is assumed to be the same fraction as for the Fire Clay Processing emission factors in AP-42 Table 11.25-7 (30 lb PM10/ton/120 lb PM/ton = 0.25).

It is assumed that a portion of the PM emissions are HAP and based on the following product:

Product Code	Highest Individual HAP	
	Percentage	HAP
55209133	52%	chromium

- b. Process emissions are controlled by the following:

Device	Capture Efficiency (%)	Control Efficiency (%)	Overall Control Efficiency (%)	Use Control in Calculated PTE?
F-1 Scrubber, TriMer Scrubber, and baghouse (calcining)	100%	95%	95%	No
F-1 Scrubber (feed)	100%	95%	95%	No
F-1 Scrubber (discharge)	100%	95%	95%	No

NATURAL GAS COMBUSTION EMISSIONS

a. The emission unit is heated with natural gas and has the following heat capacity:
The heat content of natural gas is:

1,020 Btu/scf

3.42 10^6 Btu/hr
0.003 10^6 scf/hr

b. Natural gas combustion emissions are based on the following emission factors from AP-42 Section 1.4:

Pollutant	Emission Factor (lb/ 10^6 scf)
particulate matter (PM)	7.6
PM10, filterable	1.9
nitrogen oxides (NO _x)	100
carbon monoxide (CO)	84
sulfur dioxide (SO ₂)	0.6
volatile organic compounds (VOC)	5.5
HAPs	
1,3-butadiene	
2-methylnaphthalene	2.40E-05
3-methylchloranthrene	1.80E-06
7,12-dimethylbenz(a)anthracene	1.60E-05
acenaphthene	1.80E-06
acenaphthylene	1.80E-06
acetaldehyde	
acrolein	
anthracene	2.40E-06
benz(a)anthracene	1.80E-06
benzene	2.10E-03
benzo(a)pyrene	1.20E-06
benzo(b)fluoranthene	1.80E-06
benzo(g,h,i)perylene	1.20E-06
benzo(k)fluoranthene	1.80E-06
chrysene	1.80E-06
dibenzo(a,h)anthracene	1.20E-06
dichlorobenzene	1.20E-03
fluoranthene	3.00E-06
fluorene	2.80E-06
formaldehyde	7.50E-02
hexane	1.8
indeno(1,2,3-cd)pyrene	1.80E-06
naphthalene	6.10E-04
phenanthrene	1.70E-05
pyrene	5.00E-06
toluene	3.40E-03
xylene	
arsenic	2.00E-04
beryllium	1.20E-05
cadmium	1.10E-03
chromium	1.40E-03
cobalt	8.40E-05
manganese	3.80E-04
mercury	2.60E-04
nickel	2.10E-03
selenium	2.40E-05

Emissions Calculations:

Process Emissions:

Uncontrolled PM Emissions (lb/hr)	=	(throughput rate, ton/hr) x (emission factor, lb PM/ton)
Uncontrolled HAP Emissions (lb/hr)	=	(PM emissions, lb/hr) x (max individual HAP content, lb/lb)
Controlled emissions (lb/hr)	=	(uncontrolled emissions, lb/hr) x (1 - control efficiency)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Combustion Emissions:

Emissions (lb/hr)	=	(heat capacity, 10^6 Btu/hr) / (natural gas heat content, Btu/scf) x (emission factor, lb/ 10^6 scf)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Emissions Summary:

Pollutant	Process Emissions (lb/hr)			Combustion Emissions (lb/hr)	REVISED PTE (ton/yr)	EXISTING PTE (ton/yr)	CHANGE IN EMISSIONS (ton/yr)
	Uncontrolled	Controlled	Allowable				
PM, total	34.19	1.71	3.07	0.03	13.5	7.1	6.4
PM10, total	8.65	0.43		0.03	13.5	7.1	6.4
PM10, filterable	8.65	0.43		0.01	13.5	7.1	6.4
NOx				3.4	0.34	16.4	16.4
CO					0.28	1.2	0.0
SO2					0.002	0.01	0.0
VOC					0.02	0.1	0.0
1,3-butadiene					0.0E+00	0.0E+00	0.0E+00
2-methylnaphthalene					8.0E-08	3.5E-07	3.5E-07
3-methylchloranthrene					6.0E-09	2.6E-08	2.6E-08
7,12-dimethylbenz(a)anthracene					5.4E-08	2.3E-07	2.3E-07
acenaphthene					6.0E-09	2.6E-08	2.6E-08
acenaphthylene					6.0E-09	2.6E-08	2.6E-08
acetaldehyde					0.0E+00	0.0E+00	0.0E+00
acrolein					0.0E+00	0.0E+00	0.0E+00
anthracene					8.0E-09	3.5E-08	3.5E-08
benz(a)anthracene					6.0E-09	2.6E-08	2.6E-08
benzene					7.0E-06	3.1E-05	3.1E-05
benzo(a)pyrene					4.0E-09	1.8E-08	1.8E-08
benzo(b)fluoranthene					6.0E-09	2.6E-08	2.6E-08
benzo(g,h,i)perylene					4.0E-09	1.8E-08	1.8E-08
benzo(k)fluoranthene					6.0E-09	2.6E-08	2.6E-08
chrysene					6.0E-09	2.6E-08	2.6E-08
dibenz(a,h)anthracene					4.0E-09	1.8E-08	1.8E-08
dichlorobenzene					4.0E-06	1.8E-05	1.8E-05
fluoranthene					1.0E-08	4.4E-08	4.4E-08
fluorene					9.4E-09	4.1E-08	4.1E-08
formaldehyde					2.5E-04	1.1E-03	1.1E-03
hexane					6.0E-03	0.03	0.03
indeno(1,2,3-cd)pyrene					6.0E-09	2.6E-08	2.6E-08
naphthalene					2.0E-06	9.0E-06	9.0E-06
phenanthrene					5.7E-08	2.5E-07	2.5E-07
pyrene					1.7E-08	7.3E-08	7.3E-08
toluene					1.1E-05	5.0E-05	5.0E-05
xylene					0.0E+00	0.0E+00	0.0E+00
arsenic					6.7E-07	2.9E-06	2.9E-06
beryllium					4.0E-08	1.8E-07	1.8E-07
cadmium					3.7E-06	1.6E-05	1.6E-05
chromium	17.78	0.89			4.7E-06	3.9	3.7
cobalt					2.8E-07	1.2E-06	1.2E-06
manganese					1.3E-06	5.6E-06	5.6E-06
mercury					8.7E-07	3.8E-06	3.8E-06
nickel					7.0E-06	3.1E-05	3.1E-05
selenium					8.0E-08	3.5E-07	3.5E-07
Total HAPs	17.78	0.89			0.01	3.92	3.7
							0.2

PTI APPLICATION EMISSIONS INFORMATION

Criteria Pollutants :

Pollutant	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
Particulate emissions (PE/PM) (formerly particulate matter, PM)	34.19	1.71	7.5	3.07	13.5
PM # 10 microns in diameter (PE/PM10)	8.65	0.43	1.9	3.07	13.5
PM # 2.5 microns in diameter (PE/PM2.5)	8.65	0.43	1.9	3.07	13.5
Sulfur dioxide (SO2)	No change in SO2 emissions as a result of this modification				
Nitrogen oxides (NOx)	No change in NOx emissions as a result of this modification				
Carbon monoxide (CO)	No change in CO emissions as a result of this modification				
Organic compounds (OC)	No change in OC emissions as a result of this modification				
Volatile organic compounds (VOC)	No change in VOC emissions as a result of this modification				
Lead (Pb)	0	0	0	0	0.0
Total Hazardous Air Pollutants (HAPs)	17.79	0.90	3.9	0.90	3.9
Highest single HAP - chromium	17.78	0.89	3.9	0.89	3.9

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
chromium	HAP	17.78	0.89	3.9	0.89	3.9

BASF - Elyria, OH
Potential to Emit Calculations
P102 - Rotary Calciner #2 (Building 31)

Basis:

a. Potential emissions are based on an operation schedule of:	24	hr/day		
	365	day/yr		
	8760	hr/yr		
b. Permitted allowable emissions are:	(process)	1.62	lb PM/hr	Limit from 2001 Title V based on 500 lb/hr
		1.86	lb NOx/hr	NOx RACT limit when operating the SCR
		3.4	lb NOx/hr	NOx RACT limit when operating the Trimer
	(fuel combustion)	0.02	lb PM/ 10^6 Btu	Limit from 2001 Title V
		20.4	lb PM/ 10^6 scf	(inherently compliant using AP-42)

PROCESS EMISSIONS OF PARTICULATE MATTER

- a. Maximum hourly throughput, process steps, and process emission factors are:

Emission Factor Activity	Site Specific Factor or AP-42 Section	Emission Factors		Throughput Rate		Number of Transfer Points
		PM (lb/ton)	PM10 (lb/ton)*	lb/hr	ton/hr	
Rotary calcining (Calciner process emissions to F-1 scrubber, Trimer scrubber, or baghouse and SCR.)	Site specific emission factor	52	13	1,300	0.65	
Material handling and transfer (feed) (Raw material feed from elevator to feed hopper to calciner (2 transfer points))	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1,300	0.65	2
Material handling and transfer (discharge) (Product discharge to elevator to screener to super sack (3 transfer points))	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1,300	0.65	3

* The PM10 fraction is assumed to be the same fraction as for the Fire Clay Processing emission factors in AP-42 Table 11.25-7 (30 lb PM10/ton/120 lb PM/ton = 0.25).

It is assumed that a portion of the PM emissions are HAP and based on the following product:

Product Code	Highest Individual HAP	
	Percentage	HAP
55209133	52%	chromium

- b. Process emissions are controlled by the following:

Device	Capture Efficiency (%)	Control Efficiency (%)	Overall Control Efficiency (%)	Use Control in Calculated PTE?
F-1 Scrubber, TriMer Scrubber, SCR unit and baghouse (calcining)	100%	95%	95%	No
Baghouse (feed)	100%	99%	99%	No
Baghouse (discharge)	100%	99%	99%	No

NATURAL GAS COMBUSTION EMISSIONS

a. The emission unit is heated with natural gas and has the following heat capacity:
 The heat content of natural gas is: 1,020 Btu/scf

3.55 10^6 Btu/hr
 0.003 10^6 scf/hr

b. Natural gas combustion emissions are based on the following emission factors from AP-42 Section 1.4:

Pollutant	Emission Factor (lb/ 10^6 scf)
particulate matter (PM)	7.6
PM10, filterable	1.9
nitrogen oxides (NO _x)	100
carbon monoxide (CO)	84
sulfur dioxide (SO ₂)	0.6
volatile organic compounds (VOC)	5.5
HAPs	
1,3-butadiene	
2-methylnaphthalene	2.40E-05
3-methylchloranthrene	1.80E-06
7,12-dimethylbenz(a)anthracene	1.60E-05
acenaphthene	1.80E-06
acenaphthylene	1.80E-06
acetaldehyde	
acrolein	
anthracene	2.40E-06
benz(a)anthracene	1.80E-06
benzene	2.10E-03
benzo(a)pyrene	1.20E-06
benzo(b)fluoranthene	1.80E-06
benzo(g,h,i)perylene	1.20E-06
benzo(k)fluoranthene	1.80E-06
chrysene	1.80E-06
dibenz(a,h)anthracene	1.20E-06
dichlorobenzene	1.20E-03
fluoranthene	3.00E-06
fluorene	2.80E-06
formaldehyde	7.50E-02
hexane	1.8
indeno(1,2,3-cd)pyrene	1.80E-06
naphthalene	6.10E-04
phenanthrene	1.70E-05
pyrene	5.00E-06
toluene	3.40E-03
xylene	
arsenic	2.00E-04
beryllium	1.20E-05
cadmium	1.10E-03
chromium	1.40E-03
cobalt	8.40E-05
manganese	3.80E-04
mercury	2.60E-04
nickel	2.10E-03
selenium	2.40E-05

Emissions Calculations:

Process Emissions:

Uncontrolled PM Emissions (lb/hr)	=	(throughput rate, ton/hr) x (emission factor, lb PM/ton)
Uncontrolled HAP Emissions (lb/hr)	=	(PM emissions, lb/hr) x (max individual HAP content, lb/lb)
Controlled emissions (lb/hr)	=	(uncontrolled emissions, lb/hr) x (1 - control efficiency)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Combustion Emissions:

Emissions (lb/hr)	=	(heat capacity, 10^6 Btu/hr) / (natural gas heat content, Btu/scf) x (emission factor, lb/ 10^6 scf)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Emissions Summary:

Pollutant	Process Emissions (lb/hr)			Combustion Emissions (lb/hr)	REVISED PTE (ton/yr)	EXISTING PTE (ton/yr)	CHANGE IN EMISSIONS (ton/yr)
	Uncontrolled	Controlled	Allowable	Uncontrolled			
PM, total	34.19	1.69	3.07	0.03	13.5	7.1	6.4
PM10, total	8.65	0.42		0.03	13.5	7.1	6.4
PM10, filterable	8.65	0.42		0.01	13.5	7.1	6.4
NOx			3.4	0.35	16.4	16.4	0.0
CO				0.29	1.3	1.3	0.0
SO2				0.002	0.01	0.01	0.0
VOC				0.02	0.1	0.1	0.0
1,3-butadiene				0.0E+00	0.0E+00	0.0E+00	0.0
2-methylnaphthalene				8.4E-08	3.7E-07	3.7E-07	0.0
3-methylchloranthrene				6.3E-09	2.7E-08	2.7E-08	0.0
7,12-dimethylbenz(a)anthracene				5.6E-08	2.4E-07	2.4E-07	0.0
acenaphthene				6.3E-09	2.7E-08	2.7E-08	0.0
acenaphthylene				6.3E-09	2.7E-08	2.7E-08	0.0
acetaldehyde				0.0E+00	0.0E+00	0.0E+00	0.0
acrolein				0.0E+00	0.0E+00	0.0E+00	0.0
anthracene				8.4E-09	3.7E-08	3.7E-08	0.0
benz(a)anthracene				6.3E-09	2.7E-08	2.7E-08	0.0
benzene				7.3E-06	3.2E-05	3.2E-05	0.0
benzo(a)pyrene				4.2E-09	1.8E-08	1.8E-08	0.0
benzo(b)fluoranthene				6.3E-09	2.7E-08	2.7E-08	0.0
benzo(g,h,i)perylene				4.2E-09	1.8E-08	1.8E-08	0.0
benzo(k)fluoranthene				6.3E-09	2.7E-08	2.7E-08	0.0
chrysene				6.3E-09	2.7E-08	2.7E-08	0.0
dibenzo(a,h)anthracene				4.2E-09	1.8E-08	1.8E-08	0.0
dichlorobenzene				4.2E-06	1.8E-05	1.8E-05	0.0
fluoranthene				1.0E-08	4.6E-08	4.6E-08	0.0
fluorene				9.7E-09	4.3E-08	4.3E-08	0.0
formaldehyde				2.6E-04	1.1E-03	1.1E-03	0.0
hexane				6.3E-03	0.03	0.03	0.0
Indeno(1,2,3-cd)pyrene				6.3E-09	2.7E-08	2.7E-08	0.0
naphthalene				2.1E-06	9.3E-06	9.3E-06	0.0
phenanathrene				5.9E-08	2.6E-07	2.6E-07	0.0
pyrene				1.7E-08	7.6E-08	7.6E-08	0.0
toluene				1.2E-05	5.2E-05	5.2E-05	0.0
xylene				0.0E+00	0.0E+00	0.0E+00	0.0
arsenic				7.0E-07	3.0E-06	3.0E-06	0.0
beryllium				4.2E-08	1.8E-07	1.8E-07	0.0
cadmium				3.8E-06	1.7E-05	1.7E-05	0.0
chromium	17.78	0.88		4.9E-06	3.9	3.7	0.2
cobalt				2.9E-07	1.3E-06	1.3E-06	0.0
manganese				1.3E-06	5.8E-06	5.8E-06	0.0
mercury				9.0E-07	4.0E-06	4.0E-06	0.0
nickel				7.3E-06	3.2E-05	3.2E-05	0.0
selenium				8.4E-08	3.7E-07	3.7E-07	0.0
Total HAPs	17.78	0.88		0.01	3.9	3.7	0.2

PTI APPLICATION EMISSIONS INFORMATION

Criteria Pollutants :

Pollutant	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
Particulate emissions (PE/PM) (formerly particulate matter, PM)	34.19	1.69	7.4	3.07	13.5
PM # 10 microns in diameter (PE/PM10)	8.65	0.42	1.9	3.07	13.5
PM # 2.5 microns in diameter (PE/PM2.5)	8.65	0.42	1.9	3.07	13.5
Sulfur dioxide (SO2)	No change in SO2 emissions as a result of this modification				
Nitrogen oxides (NOx)	No change in NOx emissions as a result of this modification				
Carbon monoxide (CO)	No change in CO emissions as a result of this modification				
Organic compounds (OC)	No change in OC emissions as a result of this modification				
Volatile organic compounds (VOC)	No change in VOC emissions as a result of this modification				
Lead (Pb)	0	0	0	0	0.0
Total Hazardous Air Pollutants (HAPs)	17.79	0.89	3.9	0.89	3.9
Highest single HAP - chromium	17.78	0.88	3.9	0.88	3.9

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
chromium	HAP	17.78	0.88	3.9	0.88	3.9

BASF - Elyria, OH
Potential to Emit Calculations
P103 - Rotary Calciner #3 (Building 31)

Basis:

a. Potential emissions are based on an operation schedule of:	24	hr/day	
	365	day/yr	
	8760	hr/yr	
b. Permitted allowable emissions are:	(process)	1.62 1.86 3.4 0.02 20.4	Ib PM/hr Ib NOx/hr Ib NOx/hr Ib PM/ 10^6 Btu Ib PM/ 10^6 scf
			Limit from 2001 Title V based on 500 lb/hr NOx RACT limit when operating the SCR NOx RACT limit when operating the Trimer Limit from 2001 Title V (inherently compliant using AP-42)

PROCESS EMISSIONS OF PARTICULATE MATTER

- a. Maximum hourly throughput, process steps, and process emission factors are:

Emission Factor Activity	Site Specific Factor or AP-42 Section	Emission Factors		Throughput Rate		Number of Transfer Points
		PM (lb/ton)	PM10 (lb/ton)*	lb/hr	ton/hr	
Rotary calcining (Calciner process emissions to F-1 scrubber, Trimer scrubber, or baghouse and SCR.)	Site specific emission factor	52	13	1,300	0.65	
Material handling and transfer (feed) (Raw material feed from dryer to elevator to feed hopper (3 transfer points))	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1,300	0.65	3
Material handling and transfer (discharge) (Product discharge to elevator to screener to super sack (3 transfer points))	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1,300	0.65	3

* The PM10 fraction is assumed to be the same fraction as for the Fire Clay Processing emission factors in AP-42 Table 11.25-7 (30 lb PM10/ton/120 lb PM/ton = 0.25).

It is assumed that a portion of the PM emissions are HAP and based on the following product:

Product Code	Highest Individual HAP	
	Percentage	HAP
55209133	52%	chromium

- b. Process emissions are controlled by the following:

Device	Capture Efficiency (%)	Control Efficiency (%)	Overall Control Efficiency (%)	Use Control in Calculated PTE?
F-1 Scrubber, TriMer Scrubber, SCR unit and baghouse (calcining)	100%	95%	95%	No
Baghouse (feed)	100%	99%	99%	No
Baghouse (discharge)	100%	99%	99%	No

NATURAL GAS COMBUSTION EMISSIONS

a. The emission unit is heated with natural gas and has the following heat capacity:
The heat content of natural gas is:

1,020 Btu/scf

3.55 10^6 Btu/hr
0.003 10^6 scf/hr

b. Natural gas combustion emissions are based on the following emission factors from AP-42 Section 1.4:

Pollutant	Emission Factor (lb/ 10^6 scf)
particulate matter (PM)	7.6
PM10, filterable	1.9
nitrogen oxides (NO _x)	100
carbon monoxide (CO)	84
sulfur dioxide (SO ₂)	0.6
volatile organic compounds (VOC)	5.5
HAPs	
1,3-butadiene	
2-methylnaphthalene	2.40E-05
3-methylchloranthrene	1.80E-06
7,12-dimethylbenz(a)anthracene	1.60E-05
acenaphthene	1.80E-06
acenaphthylene	1.80E-06
acetaldehyde	
acrolein	
anthracene	2.40E-06
benz(a)anthracene	1.80E-06
benzene	2.10E-03
benzo(a)pyrene	1.20E-06
benzo(b)fluoranthene	1.80E-06
benzo(g,h,i)perylene	1.20E-06
benzo(k)fluoranthene	1.80E-06
chrysene	1.80E-06
dibenzo(a,h)anthracene	1.20E-06
dichlorobenzene	1.20E-03
fluoranthene	3.00E-06
fluorene	2.80E-06
formaldehyde	7.50E-02
hexane	1.8
indeno(1,2,3-cd)pyrene	1.80E-06
naphthalene	6.10E-04
phenanthrene	1.70E-05
pyrene	5.00E-06
toluene	3.40E-03
xylene	
arsenic	2.00E-04
beryllium	1.20E-05
cadmium	1.10E-03
chromium	1.40E-03
cobalt	8.40E-05
manganese	3.80E-04
mercury	2.60E-04
nickel	2.10E-03
selenium	2.40E-05

Emissions Calculations:

Process Emissions:

Uncontrolled PM Emissions (lb/hr)	=	(throughput rate, ton/hr) x (emission factor, lb PM/ton)
Uncontrolled HAP Emissions (lb/hr)	=	(PM emissions, lb/hr) x (max individual HAP content, lb/lb)
Controlled emissions (lb/hr)	=	(uncontrolled emissions, lb/hr) x (1 - control efficiency)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Combustion Emissions:

Emissions (lb/hr)	=	(heat capacity, 10^6 Btu/hr) / (natural gas heat content, Btu/scf) x (emission factor, lb/ 10^6 scf)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Emissions Summary:

Pollutant	Process Emissions (lb/hr)			Combustion Emissions (lb/hr)	REVISED PTE (ton/yr)	EXISTING PTE (ton/yr)	CHANGE IN EMISSIONS (ton/yr)
	Uncontrolled	Controlled	Allowable				
PM, total	34.27	1.69	3.07	0.03	13.5	7.1	6.4
PM10, total	8.68	0.42		0.03	13.5	7.1	6.4
PM10, filterable	8.68	0.42		0.01	13.5	7.1	6.4
NOx			3.4	0.35	16.4	16.4	0.0
CO				0.29	1.3	1.3	0.0
SO2				0.002	0.01	0.01	0.0
VOC				0.02	0.1	0.1	0.0
1,3-butadiene				0.0E+00	0.0E+00	0.0E+00	0.0
2-methylnaphthalene				8.4E-08	3.7E-07	3.7E-07	0.0
3-methylchloranthrene				6.3E-09	2.7E-08	2.7E-08	0.0
7,12-dimethylbenz(a)anthracene				5.6E-08	2.4E-07	2.4E-07	0.0
acenaphthene				6.3E-09	2.7E-08	2.7E-08	0.0
acenaphthylene				6.3E-09	2.7E-08	2.7E-08	0.0
acetaldehyde				0.0E+00	0.0E+00	0.0E+00	0.0
acrolein				0.0E+00	0.0E+00	0.0E+00	0.0
anthracene				8.4E-09	3.7E-08	3.7E-08	0.0
benz(a)anthracene				6.3E-09	2.7E-08	2.7E-08	0.0
benzene				7.3E-06	3.2E-05	3.2E-05	0.0
benzo(a)pyrene				4.2E-09	1.8E-08	1.8E-08	0.0
benzo(b)fluoranthene				6.3E-09	2.7E-08	2.7E-08	0.0
benzo(g,h,i)perylene				4.2E-09	1.8E-08	1.8E-08	0.0
benzo(k)fluoranthene				6.3E-09	2.7E-08	2.7E-08	0.0
chrysene				6.3E-09	2.7E-08	2.7E-08	0.0
dibenzo(a,h)anthracene				4.2E-09	1.8E-08	1.8E-08	0.0
dichlorobenzene				4.2E-06	1.8E-05	1.8E-05	0.0
fluoranthene				1.0E-08	4.6E-08	4.6E-08	0.0
fluorene				9.7E-09	4.3E-08	4.3E-08	0.0
formaldehyde				2.6E-04	1.1E-03	1.1E-03	0.0
hexane				6.3E-03	0.03	0.03	0.0
indeno(1,2,3-cd)pyrene				6.3E-09	2.7E-08	2.7E-08	0.0
naphthalene				2.1E-06	9.3E-06	9.3E-06	0.0
phenanthrene				5.9E-08	2.6E-07	2.6E-07	0.0
pyrene				1.7E-08	7.6E-08	7.6E-08	0.0
toluene				1.2E-05	5.2E-05	5.2E-05	0.0
xylene				0.0E+00	0.0E+00	0.0E+00	0.0
arsenic				7.0E-07	3.0E-06	3.0E-06	0.0
beryllium				4.2E-08	1.8E-07	1.8E-07	0.0
cadmium				3.8E-06	1.7E-05	1.7E-05	0.0
chromium	17.82	0.88		4.9E-06	3.9	3.7	0.2
cobalt				2.9E-07	1.3E-06	1.3E-06	0.0
manganese				1.3E-06	5.8E-06	5.8E-06	0.0
mercury				9.0E-07	4.0E-06	4.0E-06	0.0
nickel				7.3E-06	3.2E-05	3.2E-05	0.0
selenium				8.4E-08	3.7E-07	3.7E-07	0.0
Total HAPs	17.82	0.88		0.01	3.9	3.7	0.2

PTI APPLICATION EMISSIONS INFORMATION

Criteria Pollutants :

Pollutant	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
Particulate emissions (PE/PM) (formerly particulate matter, PM)	34.27	1.69	7.4	3.07	13.5
PM # 10 microns in diameter (PE/PM10)	8.68	0.42	1.9	3.07	13.5
PM # 2.5 microns in diameter (PE/PM2.5)	8.68	0.42	1.9	3.07	13.5
Sulfur dioxide (SO2)	No change in SO2 emissions as a result of this modification				
Nitrogen oxides (NOx)	No change in NOx emissions as a result of this modification				
Carbon monoxide (CO)	No change in CO emissions as a result of this modification				
Organic compounds (OC)	No change in OC emissions as a result of this modification				
Volatile organic compounds (VOC)	No change in VOC emissions as a result of this modification				
Lead (Pb)	0	0	0	0	0.0
Total Hazardous Air Pollutants (HAPs)	17.82	0.88	3.9	0.88	3.9
Highest single HAP - chromium	17.82	0.88	3.9	0.88	3.9

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
chromium	HAP	17.82	0.88	3.9	0.88	3.9

BASF - Elyria, OH
Potential to Emit Calculations
P026 - Pfaudler Double-cone Blender B-1 (P026) (Building 31)

Basis:

Process PM Emissions:

- a. Maximum hourly throughput, process steps, and process emission factors are:

Emission Factor Activity	AP-42 Section	Emission Factors		Throughput Rates		Number of Transfer Points
		PM (lb/ton)	PM10 (lb/ton)	lb/hr	ton/hr	
Material handling and transfer (Emissions from dry material addition only max dry material addition is 700 lb/hr and 150 lb/hr liquid addition.)	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	850	0.425	1

It is assumed that a portion of the PM emissions are HAP and based on the following product:

Product Code	Highest Individual HAP	
	Percentage	HAP
55209133	52%	chromium

- b. Process emissions are controlled by the following:

Device	Capture Efficiency (%)	Control Efficiency (%)	Overall Control Efficiency (%)	Use Control in Calculated PTE?
baghouse F-8 (P024-1)	99%	99%	98%	No

- c. Potential emissions are based on an operation schedule of:
- | | |
|------|--|
| 24 | |
| 365 | |
| 8760 | |

- d. Permitted allowable emissions are: (process) 2.31 Limit from 4/17/2014 PTI based on 850 lb/hr

Process PM Emissions Calculations:

Uncontrolled PM Emissions (lb/hr)	=	(throughput rate, ton/hr) x (emission factor, lb PM/ton)
Uncontrolled HAP Emissions (lb/hr)	=	(PM emissions, lb/hr) x (max individual HAP content, lb/lb)
Controlled emissions (lb/hr)	=	(uncontrolled emissions, lb/hr) x (1 - control efficiency)
Emissions (ton/yr)	=	(emissions, lb/hr) x (8,760 hr/yr) / (2,000 lb/ton)

Process NOx Emissions:

One specific product impregnated and dried in the Pfaudler double-cone blender B-1 (P026) has the potential to generate NO₂ emissions. The carbon-based support material for this product cannot be dried at high temperature (i.e., calcined) without decomposing the support material. Therefore, the material must be dried in the double-cone blender where the temperature can be controlled via the steam jacket of the blender.

Basis:

- a. The impregnating solutions used for this product are metal nitrates and nitric acid that generate NO₂ emissions when heated.
- b. The headspace of the blender is transferred to the Trimer Scrubber for removal of the NO₂ emissions prior to discharge to the atmosphere.
- c. The batch production rate of this product is: 48 hours
- d. The NO₂ generation rate is based on the conservative assumption that all of the nitrate in the raw material is converted to NO₂ on a 1:1 mole ratio.
- e. The NO₂ generated from the batch process was calculated as follows:

Raw material	lb/batch	MW (lb/lb-mole)	lb-mole	lb-mol NO ₃ /lb-mol nitrate	lb-mol NO ₂	MW NO ₂ (lb/lb-mole)	lb NO ₂ /batch
Ag(NO ₃)	25.7	169.9	0.15	1	0.151	46	7.0
Na(NO ₃)	87.3	85.0	1.03	1	1.027	46	47.2
Fe(NO ₃) ₃	38.4	241.9	0.16	3	0.476	46	21.9
Pd(NO ₃) ₂	71.4	230.4	0.31	2	0.620	46	28.5
HNO ₃	1085.0	62.0	17.50	1	17.500	46	805.0
						Total:	909.6

f. The total uncontrolled NO₂ emissions are:

Potential Uncontrolled NO ₂ Emissions			
(lb/batch)	(lb/hr)	(lb/day)	(ton/yr)
909.6	19.0	454.8	83.0

g. The total capture efficiency of the blender headspace is: 100%

h. The design control efficiency of the Trimer scrubber is: 90%

i. The controlled NO₂ emissions was calculated as: [uncontrolled emissions x (1-90%)] = controlled emissions

j. The total controlled NO₂ emissions are:

Potential Controlled NO ₂ Emissions			
(lb/batch)	(lb/hr)	(lb/day)	(ton/yr)
91.0	1.90	45.5	8.30

These are also the allowable NOx emissions for the emission unit.

Emissions Summary:

Pollutant	Process Emissions (lb/hr) ^(a)			PTE (ton/yr)
	Uncontrolled	Controlled	Allowable	
PM, total	0.05	0.001	2.31	0.2
PM10, total	0.03	0.0005		0.1
PM10, filterable	0.03	0.0005		0.1
NOx	19.0	1.90	1.90	8.3
chromium				0.12
Total HAPs				0.12

a. Hourly emission rate is the average hourly rate: total batch emission rate (lb/batch) divided by batch time (hr/batch).

BASF - Elyria, OH
Potential to Emit Calculations
P131 - Tabletting Precursor Mixer, Dryer, and Blender (Building 10)

Basis:

a. Potential emissions were calculated based on AP-42 emission factors (identified below) and the following equation:

$$E = A \times EF \times (1-ER/100)$$

where:

E = emissions (lb/hr)

A = activity rate

EF = emission factor

ER = overall emission reduction efficiency

b. Overall control efficiency assumes 95% capture and 99% control of particulate emissions through the use of bin vents and dust collectors.

Note - Added PM removal provided by the HEPA filters after the dust collectors is not included in the overall control efficiencies.

PART 1 - POTENTIAL PM PROCESS EMISSIONS

Egress Point	Description	Emission Control	(A) Rate, ton/hr	(EF) Emission Factor, lb/ton		Emission Factor Reference	Emission Factor Description
				PM	PM10		
1	Raw powder feed system	receiver	0.193	0.58	0.58	AP-42 Table 6.1.4 - Carbon Black Manufacture	Pneumatic system vent with bag filter
2	Mixer vent	bin vent	0.220	0.6	0.6	AP-42 Table 11.13-2 - Glass Fiber Manufacturing	Mixing and weighing
2	Dryer vent	bin vent	0.220	10	10	Manufacturer (Wyssmont) case study data	Drying
3	Solids conveyor	dust collector ^(a)	0.220	0.12	0.06	AP-42 Table 11.24.2 - Metallic Minerals Processing	Material handling and transfer
3	Mill / blend system	dust collector ^(a)	0.225	0.6	0.6	AP-42 Table 11.13-2 - Glass Fiber Manufacturing	Mixing and weighing

a. HEPA after filter not included as control equipment

Egress Point	Description	Uncontrolled Emissions, lb/hr		Uncontrolled Emissions, ton/yr		Overall Control Efficiency, %	Controlled Emissions, lb/hr		Controlled Emissions, ton/yr		
		PM	PM10	PM	PM10		PM	PM10	PM	PM10	
1	Raw powder feed system	0.11	0.11	0.5	0.5	0% ^(a)	0.11	0.11	0.49	0.49	
2	Mixer vent	0.13	0.13	0.6	0.6	94%	0.0079	0.0079	0.034	0.034	
2	Dryer vent	2.20	2.20	9.6	9.6	94%	0.132	0.132	0.58	0.58	
3	Solids conveyor	0.03	0.01	0.1	0.1	94%	0.00158	0.00079	0.00694	0.00347	
3	Mill / blend system	0.14	0.14	0.6	0.6	94%	0.00810	0.00810	0.03548	0.03548	
	TOTAL	2.6	2.6	11.4	11.4		0.261	0.261	1.15	1.14	

a. The emission factor for the pneumatic transfer is based on use of a bag filter; therefore, the calculation does not account for the filter efficiency of the material receiver.

PART 2 - POTENTIAL PM-PHASE HAP EMISSIONS

PM-phase HAP emissions are estimated by multiplying the maximum percent HAP content of the charged material (% chromium) by the potential PM emission rate for the process.

Egress Point	Description	HAP Content, %	Uncontrolled HAP Emissions		Overall Control Efficiency, %	Controlled HAP Emissions	
			lb/hr	ton/yr		lb/hr	ton/yr
1	Raw powder feed system	68%	0.076	0.33	0.0%	0.076	0.33
2	Mixer vent	60%	0.079	0.35	94%	0.0048	0.0208
2	Dryer vent	60%	1.3	5.8	94%	0.079	0.35
3	Solids conveyor	60%	0.016	0.069	94%	0.0010	0.0042
3	Mill / blend system	60%	0.081	0.35	94%	0.0049	0.0213
	TOTAL	(as chromium)	1.6	6.9		0.2	0.7

PART 3 - POTENTIAL COMBUSTION EMISSIONS

Uncontrolled Criteria Pollutant and Gas-phase HAP Emissions Estimate

Maximum heat capacity of dryers: 0.85 10^6 Btu/hr

Heat content of natural gas is: 1,020 Btu/scf

Maximum fuel input: 0.001 10^6 scf/hr

Natural gas emission factor reference: AP-42, Chapter 1.4, Natural Gas Combustion

Pollutant	Natural Gas Emission Factor (lb/ 10^6 scf)	Potential Uncontrolled Emissions (lb/hr)	Potential Uncontrolled Emissions (lb/day)	Potential Uncontrolled Emissions (ton/yr)
particulate matter (PM)	7.6	0.01	0.15	0.03
PM10, filterable	1.9	0.00	0.04	0.01
nitrogen oxides (NO _x)	100	0.08	2.0	0.4
carbon monoxide (CO)	84	0.07	1.7	0.3
sulfur dioxide (SO ₂)	0.6	0.00	0.012	0.00
volatile organic compounds (VOC)	5.5	0.00	0.11	0.0
1,3-butadiene		0.00E+00	0.00E+00	0.00E+00
2-methylnaphthalene	2.40E-05	2.00E-08	4.80E-07	8.76E-08
3-methylchloranthrene	1.80E-06	1.50E-09	3.60E-08	6.57E-09
7,12-dimethylbenz(a)anthracene	1.60E-05	1.33E-08	3.20E-07	5.84E-08
acenaphthene	1.80E-06	1.50E-09	3.60E-08	6.57E-09
acenaphthylene	1.80E-06	1.50E-09	3.60E-08	6.57E-09
acetaldehyde		0.00E+00	0.00E+00	0.00E+00
acrolein		0.00E+00	0.00E+00	0.00E+00
anthracene	2.40E-06	2.00E-09	4.80E-08	8.76E-09
benz(a)anthracene	1.80E-06	1.50E-09	3.60E-08	6.57E-09
benzene	2.10E-03	1.75E-06	4.20E-05	7.67E-06
benzo(a)pyrene	1.20E-06	1.00E-09	2.40E-08	4.38E-09
benzo(b)fluoranthene	1.80E-06	1.50E-09	3.60E-08	6.57E-09
benzo(g,h,i)perylene	1.20E-06	1.00E-09	2.40E-08	4.38E-09
benzo(k)fluoranthene	1.80E-06	1.50E-09	3.60E-08	6.57E-09
chrysene	1.80E-06	1.50E-09	3.60E-08	6.57E-09
dibenzo(a,h)anthracene	1.20E-06	1.00E-09	2.40E-08	4.38E-09
dichlorobenzene	1.20E-03	1.00E-06	2.40E-05	4.38E-06
fluoranthene	3.00E-06	2.50E-09	6.00E-08	1.10E-08
fluorene	2.80E-06	2.33E-09	5.60E-08	1.02E-08
formaldehyde	7.50E-02	6.25E-05	1.50E-03	2.74E-04
hexane	1.8	1.50E-03	3.60E-02	0.01
indeno(1,2,3-cd)pyrene	1.80E-06	1.50E-09	3.60E-08	6.57E-09
naphthalene	6.10E-04	5.08E-07	1.22E-05	2.23E-06
phenananthrene	1.70E-05	1.42E-08	3.40E-07	6.21E-08
pyrene	5.00E-06	4.17E-09	1.00E-07	1.83E-08
toluene	3.40E-03	2.83E-06	6.80E-05	1.24E-05
xylene		0.00E+00	0.00E+00	0.00E+00
arsenic	2.00E-04	1.67E-07	4.00E-06	7.30E-07
beryllium	1.20E-05	1.00E-08	2.40E-07	4.38E-08
cadmium	1.10E-03	9.17E-07	2.20E-05	4.02E-06
chromium	1.40E-03	1.17E-06	2.80E-05	5.11E-06
cobalt	8.40E-05	7.00E-08	1.68E-06	3.07E-07
manganese	3.80E-04	3.17E-07	7.60E-06	1.39E-06
mercury	2.60E-04	2.17E-07	5.20E-06	9.49E-07
nickel	2.10E-03	1.75E-06	4.20E-05	7.67E-06
selenium	2.40E-05	2.00E-08	4.80E-07	8.76E-08
Total HAP	1.57E-03	3.78E-02	6.89E-03	
Max HAP	1.50E-03	3.60E-02	6.57E-03	

Emissions Summary:

Pollutant	Uncontrolled Potential Emissions				Controlled Potential Emissions			
	Process	NG Combustion	Total	Total	Process	NG Combustion	Total	Total
	lb/hr	lb/hr	lb/hr	ton/yr	lb/hr	lb/hr	lb/hr	ton/yr
PM, total	2.61	0.0063	2.61	11.44	0.26	0.0063	0.27	1.17
PM10, total	2.59	0.0063	2.60	11.38	0.26	0.0063	0.27	1.17
PM10, filterable	2.59	0.0016	2.59	11.36	0.26	0.0016	0.26	1.15
nitrogen oxides (NO _x)	0	0.08	0.1	0.4	0	0.08	0.1	0.4
carbon monoxide (CO)	0	0.07	0.1	0.3	0	0.07	0.1	0.3
sulfur dioxide (SO ₂)	0	0.001	0.001	0.00	0	0.001	0.001	0.00
volatile organic compounds (VOC)	0	0.00	0.00	0.02	0	0.00	0.00	0.02
1,3-butadiene	0	0.00E+00	0.00E+00	0.0E+00	0	0.00E+00	0.00E+00	0.0E+00
2-methylnaphthalene	0	2.00E-08	2.00E-08	8.8E-08	0	2.00E-08	2.00E-08	8.8E-08
3-methylchloranthrene	0	1.50E-09	1.50E-09	6.6E-09	0	1.50E-09	1.50E-09	6.6E-09
7,12-dimethylbenz(a)anthracene	0	1.33E-08	1.33E-08	5.8E-08	0	1.33E-08	1.33E-08	5.8E-08
acenaphthene	0	1.50E-09	1.50E-09	6.6E-09	0	1.50E-09	1.50E-09	6.6E-09
acenaphthylene	0	1.50E-09	1.50E-09	6.6E-09	0	1.50E-09	1.50E-09	6.6E-09
acetaldehyde	0	0.00E+00	0.00E+00	0.0E+00	0	0.00E+00	0.00E+00	0.0E+00
acrolein	0	0.00E+00	0.00E+00	0.0E+00	0	0.00E+00	0.00E+00	0.0E+00
anthracene	0	2.00E-09	2.00E-09	8.8E-09	0	2.00E-09	2.00E-09	8.8E-09
benz(a)anthracene	0	1.50E-09	1.50E-09	6.6E-09	0	1.50E-09	1.50E-09	6.6E-09
benzene	0	1.75E-06	1.75E-06	7.7E-06	0	1.75E-06	1.75E-06	7.7E-06
benzo(a)pyrene	0	1.00E-09	1.00E-09	4.4E-09	0	1.00E-09	1.00E-09	4.4E-09
benzo(b)fluoranthene	0	1.50E-09	1.50E-09	6.6E-09	0	1.50E-09	1.50E-09	6.6E-09
benzo(g,h,i)perylene	0	1.00E-09	1.00E-09	4.4E-09	0	1.00E-09	1.00E-09	4.4E-09
benzo(k)fluoranthene	0	1.50E-09	1.50E-09	6.6E-09	0	1.50E-09	1.50E-09	6.6E-09
chrysene	0	1.50E-09	1.50E-09	6.6E-09	0	1.50E-09	1.50E-09	6.6E-09
dibenz(a,h)anthracene	0	1.00E-09	1.00E-09	4.4E-09	0	1.00E-09	1.00E-09	4.4E-09
dichlorobenzene	0	1.00E-06	1.00E-06	4.4E-06	0	1.00E-06	1.00E-06	4.4E-06
fluoranthene	0	2.50E-09	2.50E-09	1.1E-08	0	2.50E-09	2.50E-09	1.1E-08
fluorene	0	2.33E-09	2.33E-09	1.0E-08	0	2.33E-09	2.33E-09	1.0E-08
formaldehyde	0	6.25E-05	6.25E-05	2.7E-04	0	6.25E-05	6.25E-05	2.7E-04
hexane	0	1.50E-03	1.50E-03	6.6E-03	0	1.50E-03	1.50E-03	6.6E-03
indeno(1,2,3-cd)pyrene	0	1.50E-09	1.50E-09	6.6E-09	0	1.50E-09	1.50E-09	6.6E-09
naphthalene	0	5.08E-07	5.08E-07	2.2E-06	0	5.08E-07	5.08E-07	2.2E-06
phenanthrene	0	1.42E-08	1.42E-08	6.2E-08	0	1.42E-08	1.42E-08	6.2E-08
pyrene	0	4.17E-09	4.17E-09	1.8E-08	0	4.17E-09	4.17E-09	1.8E-08
toluene	0	2.83E-06	2.83E-06	1.2E-05	0	2.83E-06	2.83E-06	1.2E-05
xylene	0	0.00E+00	0.00E+00	0.0E+00	0	0.00E+00	0.00E+00	0.0E+00
arsenic	0	1.67E-07	1.67E-07	7.3E-07	0	1.67E-07	1.67E-07	7.3E-07
beryllium	0	1.00E-08	1.00E-08	4.4E-08	0	1.00E-08	1.00E-08	4.4E-08
cadmium	0	9.17E-07	9.17E-07	4.0E-06	0	9.17E-07	9.17E-07	4.0E-06
chromium	1.6	1.17E-06	1.57E+00	6.9	0.17	1.17E-06	1.66E-01	0.73
cobalt	0	7.00E-08	7.00E-08	3.1E-07	0	7.00E-08	7.00E-08	3.1E-07
manganese	0	3.17E-07	3.17E-07	1.4E-06	0	3.17E-07	3.17E-07	1.4E-06
mercury	0	2.17E-07	2.17E-07	9.5E-07	0	2.17E-07	2.17E-07	9.5E-07
nickel	0	1.75E-06	1.75E-06	7.7E-06	0	1.75E-06	1.75E-06	7.7E-06
selenium	0	2.00E-08	2.00E-08	8.8E-08	0	2.00E-08	2.00E-08	8.8E-08
TOTAL HAP	1.6	1.57E-03	1.6	6.89	0.17	1.57E-03	0.17	0.73
MAX HAP	1.6	1.50E-03	1.6	6.89	0.17	1.50E-03	0.17	0.73

PTI APPLICATION EMISSIONS INFORMATION

Criteria Pollutants :

Pollutant	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
Particulate emissions (PE/PM)	2.61	0.27	1.2	1.51	6.6
PM # 10 microns in diameter	2.60	0.27	1.2	1.51	6.6
PM # 2.5 microns in diameter	2.60	0.27	1.2	1.51	6.6
Sulfur dioxide (SO2)	No change in SO2 emissions as a result of this modification				
Nitrogen oxides (NOx)	No change in NOx emissions as a result of this modification				
Carbon monoxide (CO)	No change in CO emissions as a result of this modification				
Organic compounds (OC)	No change in OC emissions as a result of this modification				
Volatile organic compounds (VOC)	No change in VOC emissions as a result of this modification				
Lead (Pb)	0	0	0	0	0.0
Total Hazardous Air Pollutants (HAPs)	1.57	0.17	0.7	0.17	0.7
Highest single HAP - chromium	1.57	0.17	0.7	0.17	0.7

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Emissions before controls (max)* (lb/hr)	Actual Emissions* (lb/hr)	Actual Emissions* (ton/year)	Requested Allowable* (lb/hr)	Requested Allowable* (ton/year)
chromium	HAP	1.57	0.17	0.7	0.17	0.7

BASF - Elyria, OH
Potential to Emit Calculations
TMP189513 - Gen Cat Mixer #2 (Littleford Line 2) (Building 31)

Basis:

- a. Maximum hourly throughput, process steps, and process emission factors are:

Emission Factor Activity	AP-42 Section	Emission Factors		Throughput Rate		Number of Transfer Points
		PM (lb/ton)	PM10 (lb/ton)	lb/hr	ton/hr	
Material handling and transfer (Line 2 Littleford Mixer - assumes max throughput of Line 2 extruder, P&S drier 2, and No. 2 calciner)	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1300	0.650	1

It is assumed that a portion of the PM emissions are HAP and based on the following product:

Product Code	Highest Individual HAP	
	Percentage	HAP
55209133	52%	chromium

- b. Process emissions are controlled by the following:

Device	Capture Efficiency (%)	Control Efficiency (%)	Overall Control Efficiency (%)	Use Control in Calculated PTE?
baghouse	99%	99%	98%	No

c. Potential emissions are based on an operation schedule of:

24	hr/day
365	day/yr
8760	hr/yr

d. Allowable emissions are:

(process)	2.31	lb PM/hr	Limit from 10/1/1991 PTO based on 850 lb/hr
			Previously part of P027, which was on Registration Status.

Emissions Calculations:

Process Emissions:

$$\begin{aligned}
 \text{Uncontrolled PM Emissions (lb/hr)} &= (\text{throughput rate, ton/hr}) \times (\text{emission factor, lb PM/ton}) \\
 \text{Uncontrolled HAP Emissions (lb/hr)} &= (\text{PM emissions, lb/hr}) \times (\text{max individual HAP content, lb/lb}) \\
 \text{Controlled emissions (lb/hr)} &= (\text{uncontrolled emissions, lb/hr}) \times (1 - \text{control efficiency}) \\
 \text{Emissions (ton/yr)} &= (\text{emissions, lb/hr}) \times (8,760 \text{ hr/yr}) / (2,000 \text{ lb/ton})
 \end{aligned}$$

Emissions Summary:

Pollutant	Process Emissions (lb/hr)			PTE (lb/day)	PTE (ton/yr)
	Uncontrolled	Controlled	Allowable	Uncontrolled	Uncontrolled
PM, total	0.08	0.002	2.31	1.87	0.34
PM10, total	0.04	0.001		0.94	0.17
PM10, filterable	0.04	0.001		0.94	0.17
chromium	0.04	0.001		0.97	0.18
Total HAPs				0.97	0.18

This emission unit remains de minimis at the increased throughput rate of 1,300 lb/hr.

BASF - Elyria, OH
Potential to Emit Calculations
P110 - Gen Cat Mixer #3 (Littleford Line 3) (Building 31)

Basis:

- a. Maximum hourly throughput, process steps, and process emission factors are:

Emission Factor Activity	AP-42 Section	Emission Factors		Throughput Rate		Number of Transfer Points
		PM (lb/ton)	PM10 (lb/ton)	lb/hr	ton/hr	
Material handling and transfer (Line 3 Littleford Mixer - assumes max throughput of Line 3 extruder, P&S drier 3, and No. 3 calciner)	Metallic Minerals Processing, Table 11.24-2	0.12	0.06	1,300	0.650	1

It is assumed that a portion of the PM emissions are HAP and based on the following product:

Product Code	Highest Individual HAP	
	Percentage	HAP
55209133	52%	chromium

- b. Process emissions are controlled by the following:

Device	Capture Efficiency (%)	Control Efficiency (%)	Overall Control Efficiency (%)	Use Control in Calculated PTE?
baghouse	99%	99%	98%	No

c. Potential emissions are based on an operation schedule of:

24	hr/day
365	day/yr
8760	hr/yr

d. Permitted allowable emissions are:

(process)	2.31	lb PM/hr	Limit from 10/1/1991 PTO based on 850 lb/hr
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Previously part of P027, which was on Registration Status.

Emissions Calculations:

Process Emissions:

$$\text{Uncontrolled PM Emissions (lb/hr)} = (\text{throughput rate, ton/hr}) \times (\text{emission factor, lb PM/ton})$$

$$\text{Uncontrolled HAP Emissions (lb/hr)} = (\text{PM emissions, lb/hr}) \times (\text{max individual HAP content, lb/lb})$$

$$\text{Controlled emissions (lb/hr)} = (\text{uncontrolled emissions, lb/hr}) \times (1 - \text{control efficiency})$$

$$\text{Emissions (ton/yr)} = (\text{emissions, lb/hr}) \times (8,760 \text{ hr/yr}) / (2,000 \text{ lb/ton})$$

Emissions Summary:

Pollutant	Process Emissions (lb/hr)			PTE (lb/day)	PTE (ton/yr)
	Uncontrolled	Controlled	Allowable		
PM, total	0.08	0.002	2.31	1.87	0.34
PM10, total	0.04	0.001		0.94	0.17
PM10, filterable	0.04	0.001		0.94	0.17
chromium	0.04	0.001		0.97	0.18
Total HAPs				0.97	0.18

This emission unit remains de minimis at the increased throughput rate of 1,300 lb/hr.